ATTACHMENT 4.9.1

MANHOLE INSPECTION PROCEDURE

Manhole inspection is that part of the physical survey where the physical condition of the sewer system is visually evaluated. The information collected indicates many of the infiltration and inflow sources in the system. The manhole inspection also verifies manhole location and line segment continuity as given on the sewer map. In addition, it provides for establishment of a preparatory cleaning program for internal inspection and routine sewer maintenance program. The manhole inspection includes an inspection of the manhole as well as the lines tributary to that manhole.

SAFETY

Safety is an important consideration both on the surface and in the manhole. When inspecting manholes on the street, traffic control is important. Whenever possible, the inspection vehicle should be orientated within several feet of the manhole. Space should always be left for the passage of traffic. Safety (traffic) cones should be arranged appropriately to alert traffic of the work. When heavy traffic is present, arrangements should be made to have sufficient people available to flag traffic.

The manhole inspection is conducted by at least two persons. The attendant records the information while the entrant observes and relates the information. The safety of the entrant in the manhole shall be considered at all times. Safety procedures as described in the RJN Group, Inc. Safety Manual shall be followed at all times. Prior to inspection, the manhole shall be allowed to vent and when necessary, a blower should be used to introduce fresh air. The entrant must always wear a hard hat, harness connected to a mechanical retrieval device (if manhole is greater than five feet deep), lanyard, and have at least one attendant at the surface before entering the manhole.

GENERAL

The information obtained during a manhole inspection is essential to a successful rehabilitation program. The information entered on the computer coded manhole inspection form is necessary to provide a classification of deficiencies in the sewer system. In some cases, the computer coded information entered is not sufficient in describing field conditions and additional written comments are required. For major defects, comments should be made to explain the type and extent of the deficiency. Any comments providing meaningful information should be made. In addition, photographs should also be taken when distinctive problems are found.

NEW MANHOLES, NOT-FOUND MANHOLES, AND BURIED MANHOLES

Attempts should be made to locate and inspect all manholes within the system. New manholes should be inspected and located on the map, assigned with the next consecutive number available for that basin, and the "New Manhole" form, if used, shall be completed and turned in that day. Manholes which are not located properly on the existing map should be shown at the correct location on the field map and noted on the visual pipe form as a routing change. Detailed 8 " x 11" field sketches showing the location of an unmapped area should be prepared and turned in with daily inspection forms for processing. In cases where located manholes are surcharged preventing internal inspection and lamping, the form should be noted and the project engineer should be notified for appropriate action. Manholes should only be indicated as "not-found" after approximately a 15 minute search with a metal detector. Discretion should be used for uncovering buried manholes. The location of buried manholes should be clearly shown on a sketch on the manhole form.

THE MANHOLE INSPECTION

The manhole inspection begins with visual observations at the surface including manhole location. For all manholes found, the location type should be marked. In addition, if either paved easement (for paved area) or grass easement (for non-paved area) is marked a description of the location should be noted (e.g. driveway, parkway). A determination of whether or not the cover is subject to ponding must be made. This is critical for determining the quantity of cover, rim, and corbel inflow. Ponding can take place when water from a large area drains toward a manhole even though the manhole is not below the immediate surrounding grade. In such a case, the area drained should be roughly estimated, and an estimate of the depth of flow which would pass over the manhole should be made. The estimate should be to the nearest inch. The smallest depth which may be entered is 1.0 inch. For a "sheeting" of flow over a cover in a street, a depth of 0.0 inches may be used. Ponding can also take place where the manhole is lower than the immediate surrounding grade. In such a case, the area drained should be estimated, and the depth of ponding (distance below grade) should be estimated. The estimate should be made to the nearest inch.

The Manhole Cover

A number of entries and rates required on the manhole inspection form concern the manhole cover. First, the type of cover should be noted. Rim fit should be noted while the cover is on the frame. A poor fit exists if the cover rocks or if there is a greater than inch clearance between the cover and frame. The number of holes and size of the holes should be measured and marked. If the size of the holes do not correspond with the sizes given, the closest available entry should be marked and the actual size should be noted. The size of the clear opening should then be measured to the nearest 0.25 inch. The clear opening refers to the frame opening diameter, not the outside frame diameter or the cover diameter. In addition, the frame should be measured from the inside top of the rim on one side of the manhole to the inside top

of the rim on the opposite side of the manhole, and a second measurement from the bearing surface to the rim should be recorded. Any manufacturer's number on the bottom of the cover should also be noted. Evidence of inflow can be determined by actually observing the flow or by looking for signs of cover inflow such as mud, dirt, stones, or water marks around the rim.

The Frame and Frame Grade

The condition of the frame and the frame grade adjustments should be observed as the inspector descends the manhole. The condition of the frame refers only to any cracks or chips in the bearing surface in the metal frame and should be noted. Frame adjustments are generally precast concrete rings, blocks, or bricks that help establish the manhole frame grade level. The total depth of grade adjustments should be measured and noted. The type or types of adjustments should be entered along with the number of rows of each type of grade adjustment. If more than one type of adjustment is found, the most critical form code box should be checked with a note concerning the other adjustments. The condition of the grade adjustment should be noted. Cracks, gaps, and offsets should be all entered. When there is no seal, "NONE" should be entered. Evidence of inflow can be determined by checking for mud or water marks.

The Corbel and Walls

Both the corbel and walls should be checked for type of construction and for defects including cracks, deterioration, roots, leaking joints, leaking steps, or poor lifting hole seals. Minor superficial cracks do not necessarily constitute cracked walls. If one or more holes other than lifting holes exist, the hole(s) should be measured and noted in the space provided. Evidence of inflow and infiltration (I/I) can be noted by actually observing flow or by observing evidence of flow. Evidence of the I/I can be determined by observing mud, water stains, or mineral deposits on the walls. The inside diameter of the manhole should be measured to the nearest inch and noted. Any indication of surcharge or groundwater levels should be noted and measured to the nearest 0.1 foot from the manhole invert.

Only active, leaking sources should be used as indicators of groundwater level. Again, comments on the form are very important to clarify any defects which are noted.

Prior to the lamping of the line, a number of observations need to be made at the bottom of the manhole. The construction as well as the condition of the bench and trough should be noted. Special attention should be given to a raised or depressed trough which is restricting flow. The type and depth of any deposition on the bench should be noted on the visual pipe form. Again, any infiltration or evidence of infiltration should be noted. Attention should be given to the bench to wall seal where infiltration is often hidden by mud and debris.

Concrete seals are normally used to prevent groundwater from entering the manhole around the pipe. A defective pipe seal or the lack of pipe seal would result in infiltration. If any of the pipe seals in a manhole are defective, the appropriate entry should be made on the manhole form indicating the quantity which are defective and the direction (North, South, East, West) of the defective pipe seals. Again, any actual infiltration or evidence of such should be noted. Special structures and conditions should be noted and illustrated on the form or by an attached drawing. High point manholes, key manholes, storm connections, and relief structures should be noted. All reasons for not completing the form should be noted such as "surface inspection only" or any other situation that would prohibit lamping or other data collection.

VISUAL PIPE INSPECTION

The lamping of a line is accomplished by looking down a line which is illuminated by artificial light. The viewing of the line may be performed by actually looking down the line or by using a mirror. Where lamping is not possible due to depth of flow or the physical construction of the manhole, a note of "cannot lamp" (CNLP) should be made with a brief explanation as to why the lamping cannot be performed.

As in manhole inspection, brief notes are very important in identifying significant defects found during lamping. For instance, in cases where visible infiltration is observed, an estimate of the infiltration rate should be made and noted. In cases where significant defects are observed, internal TV inspection may be recommended. Photographs are useful in documenting distinctive problems in the lamping.

The lamping of individual lines should be identified on the visual pipe form. The pipe must be identified properly. First the manhole number from where the line is coming or going should be identified. In addition, for each pipe it should be noted the direction (N,S,E, or W) of where the line enters or exits the manhole. The line should also be identified as incoming (I) or outgoing (O). Stubs or services should be noted as such. Lines of unknown origin should be investigated to determine if this is a new line not identified on the map or whether it could be an overflow. When a line is in question, a tracing with dye should be made whenever possible.

While lamping the lines, the inspector should look for irregularities which could indicate possible defects. Root intrusion in a line is an indicator of cracks in the joints or a pipe that could permit infiltration. Deposition in a line would indicate a sag or some change in the line or grade of the pipe. The type and amount of deposition should be measured at the point where the pipe enters the manhole.

Several general conditions should also be noted while lamping a line. The overall structural condition should be noted. Determination of such a rating has been discussed in the manhole standards. An assessment should also be made of the line or grade of pipe. Only major offsets (0.5 inch or greater) should be entered. Often minor offsets are observed but do not constitute a significant defect. The same consideration should apply to an observed sag. Minor deficiencies should be noted,

but entries are not necessary. While lamping, any visible infiltration observed in the line should also be entered with an estimate of the flow quantity.

During lamping, pipe diameter and material of construction should be noted. The diameter should be measured to the nearest inch. Care should be taken to measure the actual pipe and not the bell of the pipe. Hard deposits can cause a faulty reading and should be noted.

A recommendation for cleaning should be made following the lamping of a line. A line may require either flushing, jetting, bucketing, or root cutting. As a general rule, flushing should be indicated when no deposition exists, Jetting should be indicated when light deposits exist (up to 20 percent pipe diameter of sludge). Bucketing should be indicated when heavy deposits exist. Last, root cutting should be indicated when root intrusion is observed.

A vertical measurement between the top of the rim and invert is necessary to calculate the slope of the pipe. A vertical reading is often difficult without the use of a "level stick" which extends from the crown of the pipe to approximately the center of the manhole during the rim to invert measurement. The rim to crown measurement should be recorded under the appropriate column for each pipe and the pipe diameter, added with the total rim to invert distance entered to the nearest 0.01 foot in the appropriate line on the Visual Pipe Form. A stiff invert stick should be laid across the manhole rim to provide an accurate reading of the measurement. For outside drop lines, the top pipe should be the pipe for which information is recorded.

A liquid depth reading and a flow velocity reading are needed to determine the actual flow in the line. The depth of flow for all pipes entering the manhole being inspected should be measured to the nearest 0.25 inch. This reading should include any measured deposition. A velocity reading should be taken for all pipes 8" in diameter or larger when depth of flow allows a reading (generally 2" of flow). The velocity reading should be taken only in the main trough of the manhole at approximately 60 percent depth flow. If a metered velocity reading cannot be taken either because of insufficient depth of flow or meter malfunction, an estimate of velocity should be made and the appropriate box checked.

Work Report

A Field Crew Daily Work Report should be completed each day. The number of manholes entered, buried, not found, not inspected, or surface inspected should be logged daily. Any manholes not completely inspected (for example, surcharged manholes) should be completed when conditions allow. These manholes should not be included in daily reports until work is completed. Manholes which were not found or were buried should be noted as such. Public works personnel are generally available for assistance in locating these manholes. New manholes, public or private, should also be noted. In addition to noting these items, field maps should be marked accordingly. Any pertinent comments or mapping changes should be marked. The

revisions on the final map should reflect the changes made on the field maps. Comments should also be made on the inspection log whenever needed.

MANHOLE INSPECTION FORM STANDARDS

Entry Number	Description
Project No.:	The project number should be clearly stated.
Project Name:	The project name should be stated. Project initials or an abbreviated name may be acceptable. The form can be stamped with a project name stamp during office review.
By:	The person recording the data should enter his (her) inspector number followed by the inspector number of the person performing the internal inspection.
Date:	The date should be indicated.
1. Manhole No.:	The number on the map should be entered. In cases where new manhole are located or where a manhole is not numbered, it should be numbered with the next available number or clearly indicated that the appropriate number was unknown. The location and number, if available, should be noted on the field map.
2. Street:	Indicate the approximate location of the manhole with respect to house number, intersections, or other manholes.
3. Precipitation:	As observed.
4 Ground:	As observed.
5. Location:	The physical location of the manhole should be stated. "BURIED" indicates where the manhole has been located with a metal detector. The location of the manhole should be shown in a sketch on the bottom of the form. "NOT FOUND" indicates when a manhole cannot be located. "CENTER STREET" indicates when the manhole is located anywhere on the street excluding the shoulder, curb, or gutter areas. "CURB" indicates when any part of the manhole frame is constructed in a concrete curb. A simple sketch or brief description is necessary to adequately quantify inflow and to evaluate rehabilitation cost. "GUTTER" indicates when a manhole is on the shoulder of a road or in the drainage area along a concrete curb. "PAVED

EASEMENT" indicates all areas that are paved and are not located in the street, curb, or gutter. "GRASSED EASEMENT" indicates all areas that are not paved and are not located in a ditch. "DITCH" indicates all manholes located in a ditch. "NOT INSPECTED" should be marked for all manholes located and not buried, but because of other circumstances were not inspected. The reasons for not inspecting the manhole should be clearly indicated on the form.

6. Subject to Ponding: Indicates whether the manhole is located below the surrounding grade or is subject to surface run-off. If it is subject to ponding, a rough estimate of the area draining the manhole should be made.

Cover:

7. Type: Indicates the type of cover on the manhole. "BOLTED" refers to a cover with bolt holes. The number of open holes should be indicated. "PICK" refers to a conventional cover with one or more lifting holes. "CONCEALED" refers to a cover with concealed pickholes. "CONCEALED" covers should be indicated as having zero holes. "STORM" refers to a cover with many holes designed to intercept storm water. "VENT" refers to a cover with several holes in the center allowing for passage of air. The bottom of each should be inspected for manufacturer's catalog number. This number should be recorded.

8. Cover to Rim Fit: Indicates the observed fit. A "POOR" fit indicates that the cover 'rocks' or is loose or tight in the frame. A "FAIR" represents most cases observed in the field. A "SEALED" fit is when a cover is physically sealed with either a gasket or bolted cover. A tar seal does not constitute SEALED, but this information should be clearly indicated on the form.

9. Diameter of Clear Opening: This should be measured to the nearest 1/4". This refers to the actual frame opening and not the outside frame diameter or cover diameter. In addition, frame measurements from the inside top rim to the opposite inside top rim and the bearing surface to rim top should be recorded to the nearest 1/4".

10. Number of Holes in Cover: As observed. For concealed pick covers or bolted covers with all bolts present, "0" should be entered for the number of holes. If

pickholes exist in the cover, the number of pickholes should be noted. The number of the open bolt holes should also be noted.

11. Hole Size in Cover: As observed. If pickholes exist in the cover, the diameter of pickholes should be measured across the pickhole at the outside circumference of the cover. The diameter of the open bolt holes should also be measured.

12. Distance Above or Below Grade: The distance of the cover above or below the surrounding grade should be estimated to the nearest inch. If at grade or in a paved area subject to "sheeting action," a dash "-" should be entered.

13. Evidence of Inflow: As observed. A rate should be entered in cases where inflow is occurring at the time of inspection.

Frame:

14. Condition: Indicates the structural condition of the frame. A tilted frame should be noted.

15. Frame Adjustment: As observed. The vertical height and the number of rows of each type of frame grade adjustment should be recorded. "NONE" should be entered in cases where the frame rests directly on the corbel or wall.

16. Frame to Corbel Seal: Indicates the structural condition of either the adjustments or the seals between the adjustments. Adjustments which are offset from the frame should be measured to the nearest inch. "NONE" should be indicated when there is no evidence of the frame being sealed to the adjustment rings or the walls. The adjustment which is defective should be noted on the boxes. If multiple defects exist, the most critical should be entered along with a note of the other defects.

17. Evidence of Inflow: As observed. A rate should be entered in cases where inflows occur at the time of inspection.

Corbel:

18. Construction: Refers to the cone or flattop section of the manhole. The construction type should be entered as observed. "NONE" should be entered as observed. "NONE" should be entered when the frame sets directly on the manhole wall.

19. Condition: As observed. It should be noted, when the joint between the corbel and wall is at a distance greater than 5' below the ground surface, the joint is considered to be a wall joint, not a corbel joint. "CRACKED" indicates cracks in the corbel itself. "DETERIORATED" indicates crumbling of concrete (not flaking), falling of bricks or blocks, large holes or other major deficiencies. The dimensions of the brick(s) or block(s) mission or the size of the hole(s), other than lifting holes shall be measured and noted. "ROOTS" indicates root intrusion through seals, joints, or corbel defects. "LEAKING JOINTS" indicates bad seals between the corbel and wall section. "POOR LIFTING HOLE SEAL" refers to the holes which are found in a corbel section which are used to lift the section during construction. Again, multiple defects should be treated as in Line 16.

20. Evidence of Inflow: As observed. A rate should be entered in cases where inflow is occurring at the time of the inspection.

Wall:

21. Construction: As observed. "NONE" should be entered in the case of shallow manholes where only a corbel exists.

22. Condition: The wall is defined from the corbel to wall joint to the bench to wall joint inclusive provided the corbel to wall joint is greater than 5' below the surface. This indicates the structural condition of the walls. "CRACKED" indicates cracks in the wall itself. "DETERIORATED" indicates crumbling of concrete (not flaking), falling of bricks, large holes or other major deficiencies. The dimensions of the brick(s) or block(s) missing or the size of the hole(s), other than lifting holes shall be measured and noted. "ROOTS" indicates root intrusion through seals, joints, or wall defects. "LEAKING JOINTS" indicates bad seals between wall sections. "POOR LIFTING HOLE SEAL" refers to the holes which are found in a wall section which are used to lift the section during construction. Again, multiple defects should be treated as in Line 16.

23. Evidence of Infiltration: As observed. A rate should be entered in cases where infiltration occurs at the time of the inspection.

Bench/Trough:

24. Trough Construction: As observed.

25. Bench Construction /Conditions: As observed.

26. Trough Condition: As observed. "RAISED" indicates that a section of the trough is at a higher level than the flowline while "DEPRESSED" indicates a section is at a lower level than the flow line. "UNFINISHED" indicates a trough that is not finished properly such as a trough narrower than the pipe.

27. Evidence of Infiltration: As observed for the trough and the trough to bench joint. A rate should be entered in cases where infiltration occurs at the time of inspection.

Pipe Seals:

28. Condition: Indicates the structural condition of the seal between the pipe and the walls. "NONE" should be indicated where there is no seal.

29. Evidence of Infiltration: As observed. A rate should be entered in cases where infiltration is occurring at the time of inspection.

Steps:

30. Condition: Any missing steps should also be noted. A manhole with out steps should be indicated as "NO STEP".

31. Condition: As observed. "UNSAFE" refers to deteriorated steps.

32. Manhole Inside Diameter: The distance between manhole walls should be measured to the nearest inch. Manholes which are irregularly shaped should be noted.

33. Surcharged at

Time of Inspection: Sewage levels above the crown of the pipe should be noted. The water level should be measured from the rim to the surcharge level and measured to the nearest 0.1 foot. Only manholes which are surcharged during several attempted inspections should be considered as inspected. Manholes which are surcharged only after storm events should be inspected during lower flow rates when surcharge conditions do not exist.

34. Evidence of Surcharging: Paper, solids, debris or grease deposits on the walls or steps should be noted. The surcharge level above the invert should be measured to the nearest 0.1 foot.

35. Indication of Groundwater Level: This should be noted only when visible infiltration is occurring. The level above the invert should be measured to the nearest 0.1 foot.

Visual Pipe Inspection Form Standards

Entry Number	Description
1. Manhole No:	Enter as on Manhole Inspection Form. The direction you face when looking toward the connecting manhole (N,S,E,or W) should be noted at the top of the column and whether the pipe is incoming (I) or outgoing (O).
5. Connected to Manhole No.:	Indicate the manhole number on the corresponding visual pipe inspection. Manholes which were not found should still be accounted for on the Visual Pipe Form. Service lines which are lamped will not have a manhole number and should be noted by indicating service "SERV". Other unknown lines should be investigated further to determine if the line is a stub or if a new manhole can be located. A stub will not have a manhole number and should be noted by indicating "STUB." Another form should be filled out if additional space is needed.
6. Is This a Relief Line:	This can be determined by referring to the map. A relief line is where two or more lines run parallel between two manholes.
7. Diameter of	

Pipe: As measured to the nearest inch. Care should be taken not to measure the bell of the pipe.

8. Type of Pipe: As observed. Materials other than those listed should be noted by marking box 5 with the type of pipe described in the space provided.

9. Root Growth in Pipe: As observed. The degree of root growth (light, medium, heavy) should be noted.

10. Amount of Deposition in Pipe: This should be measured in the mouth of the pipe when the liquid depth reading are taken. This should be measured to the nearest 0.25 inch.

11. Type of Deposition in Pipe: As observed.

12. Structural Condition of Pipe: "FAIR" structural condition indicates hairline radial or longitudinal cracks. "POOR" condition indicates open cracks, major breaks, and collapsed pipe.

13. Line/Grade of Pipe: A sag indicates a misalignment or a dip in the line. An offset is a misalignment of pipe joints. Only major offsets (greater than 0.5 inch) should be noted.

14. Visible Infiltration in Pipe: As observed. In cases where a rate can be estimated, this should be noted.

15. Is This a Drop Connection: As observed.

15. Depth from Manhole Rim to Invert: This is a vertical distance in feet from the manhole rim to the invert of the pipe. This should be made to the nearest 0.01 foot. An attempt should be made to obtain as close to a vertical reading as possible. In cases where manhole construction does

not allow a direct reading from the pipe crown to the rim, a level should be used to "extend" the pipe and allow a vertical reading. Measurements taken in this way from the rim to the pipe crown should be recorded beneath each of the respective pipe columns and the pipe diameter added after the inspection is complete.

17. Method of Cleaning: As observed. No deposition would require flushing. Light to moderate deposition in pipes would require jet cleaning. Heavy deposition, grease, or solids build-up would require bucketing. Root growth would require a root cutter. If more than one method is required, the most critical should be entered with a note regarding the additional cleaning required.

18. Downstream of A Lift Station: This specifies a force main downstream of a pump station.

19. Depth of Flow: This should be measured in the mouth of the pipe as it enters the manhole. This reading should be to the nearest 0.25 inch and should include the deposition. If there is no depth of flow, "O" should be entered.

19. Velocity of Flow: All pipes 8" or greater in diameter and where sufficient liquid depth exists require a velocity measurement. If there is ponding only in a manhole, it should be noted and "O" should be entered for velocity. If a measured velocity reading cannot be taken because of insufficient depth or meter malfunction, an estimated velocity should be entered and the appropriate box should be checked.

Attached are the following forms for reference:

Exhibit MI-1 - Manhole Inspection Form
Exhibit MI-2 – Confined Space Entry Permit
Exhibit MI-3 - Manhole Inspection Form – scan type
Exhibit MI-4 – Visual Inspection Form – scan type

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Manhole Inspection Form

Project Name: _____ Project No. RJN - _____ By: _____

2. Street Name _____ Client No. _____ Date: _____

1.Manhole No. (_____)

(Circle All That Apply)

3. Precipitation: 1. None 2. Light Rain 3. Heavy Rain 4. Snow

4. Ground: 1. Dry 2. Wet 3. Standing Water **5. Type:** 1. Manhole 2. Cleanout

6. Location: 1. Buried 2. Not Found 3. Center of Street

7. Location Characteristics: Subject to Ponding YES NO Ponding Depth_____ inches Potential Area Drained _____ Sq. Feet
Subject to Sheeting: YES NO

8. Cover: Type 1. Bolted 2. Pick 3. Concealed 4. Storm/Vent 5. Bolts in Holes 6. None

9. Cover to Rim Fit: 1. Poor 2. Fair 3. Sealed

10. Diameter of Cleaning Opening_____Inches Cover Bearing Surface_____Inches (diameter) X_____Inches (Depth)

11. Number of Holes in Cover_____ 12. Pick Hole Diameter (inches) 0.5 1.0 1.5 2.0 2.5

13. Distance Above or Below Ground +/- _____ (Inches) 14. Evidence of Inflow: YES NO Rate_____ GPM

15. Frame: Condition: 1. Sound 2. Broken

16. Frame Adjustment 1. Precast 2. Brick 3. Block 4. Other 5. None Verticle Hgt:_____ Inches

17. Frame to Corbel Seal: 1. Sound 2. Offset, by _____ Inches 3. Cracked 4. None 5. Deteriorated

18. Evidence of Inflow: YES NO Rate_____ GPM

19. Corbel: Construction 1. Brick 2. Precast 3. Block 4. Flattop 5. None 6. Grouted 7. Poured

20. Condition: 1.Sound 2.Cracked 3.Deteriorated 4.Roots 5.Leaking Joints 6.Leaking Step/Lifting Hole 7.Loose/Missing Bricks

21. Evidence of Infiltration: YES NO Rate_____ GPM

22. Walls: Construction: 1. Brick 2. Block 3. Precast 4. Poured 5. None

23. Condition: 1.Sound 2.Cracked 3.Deteriorated 4.Roots 5.Leaking Joints 6.Leaking Step/Lifting Hole

24. Evidence of Infiltration: YES NO Rate_____ GPM

25. Bench: Bench Construction: 1. Precast 2. Brick 3. Poured 4. None

26. Bench Condition: 1. Sound 2. Cracked 3. Unfinished 4. Deteriorated

27. Bench Disposition: 1. None 2. Mud 3. Debris 4. Sludge Depth of Deposits_____ Inches

24. Evidence of Infiltration: YES NO Rate_____ GPM

29. Trough: Trough Construction: 1. Precast 2. Brick 3. Poured 4. Pipe 5. None

30. Trought Conditions: 1. Sound 2. Cracked 3. Unfinished 4. Deteriorated

31. Trough Disposition: 1. None 2. Mud 3. Debris 4. Sludge Depth of Deposits_____ Inches

32. Evidence of Infiltration: YES NO Rate_____ GPM

33. Pipe Seals: Condition: 1. Sound 2. Cracked 3. None

34. Evidence of Infiltration: YES NO Rate_____ GPM

35. Steps: Condition: 1. Safe 2. Unsafe 3. Loose 4. Missing Steps Construction 5. Metal 6. Plastic 7. Other 8. None

36. Manhole Inside Diameter_____ Inches Cleanout

37. Surcharged at the Time of Inspection: YES NO Depth of Rim to Water Level_____ Feet

38. Evidence of Surcharging: YES NO Deposits on: 1. Steps 2. Walls Height Above Invert_____Feet

39. Indication of Groundwater Level: YES NO Height Above Invert_____Feet

Confined Space Entry Permit

Project Name: Project No.:

Sewer Manhole Confined Space Entry Permit

Manhole No. (____)_____Date ____/____/

Manhole entry is not allowed unless all pre-entry conditions are acceptable as noted on this permit and the following equipment is in place:
- Operating gas dector in manhole
- Retrieval equipment in place
- Harness and life line attached
- Ventilation equipment operating for minimum of three minutes
- Personal protective equipment on:
  - Gloves
  - Hard Hat
  - Steel-toed Boots
- Rescue procedures for project identified above must be posted in vehicle and visible.
- Supervisor initials on permit certify all above conditions met

Authorized Entrant: _____
Entry Supervisor: _____
Supervisor as Attendant: Y N
If no, Authorized Attendant: _____
Entry Authorized ❑
Entry Supervisor Signature
✕_____
Time: __:__ ❑ AM ❑ PM
Permit duration 30 min. unless noted.
Comment on Hazards or Safety Procedure Deviations:

Pre-Entry Checklist
Surrounding Area Check P F
Engulfment Hazard Y N
Slip Hazard Y N
Communication Equipmt. Y N
Confined Space Atmosphere
Gas Det S/N: ____ Cal Date: _____
Oxygen:_____> 19.5% and < 23.5%
Combustible:_____< 10% LEL Methane
Toxic: (1) _____ <10ppm H_2S
Source Isolation Required Y N

(1) ENMET CGS-90R: uses Broad Range Nonspecific sensor: 5 to 7 ppm H_2S = 35 ppm CO

Sewer Manhole Confined Space Entry Permit

Manhole No. (____)_____Date ____/____/

Manhole entry is not allowed unless all pre-entry conditions are acceptable as noted on this permit and the following equipment is in place:
- Operating gas dector in manhole
- Retrieval equipment in place
- Harness and life line attached
- Ventilation equipment operating for minimum of three minutes
- Personal protective equipment on:
  - Gloves
  - Hard Hat
  - Steel-toed Boots
- Rescue procedures for project identified above must be posted in vehicle and visible.
- Supervisor initials on permit certify all above conditions met

Authorized Entrant: _____
Entry Supervisor: _____
Supervisor as Attendant: Y N
If no, Authorized Attendant: _____
Entry Authorized ❑
Entry Supervisor Signature
✕_____
Time: __:__ ❑ AM ❑ PM
Permit duration 30 min. unless noted.
Comment on Hazards or Safety Procedure Deviations:

Pre-Entry Checklist
Surrounding Area Check P F
Engulfment Hazard Y N
Slip Hazard Y N
Communication Equipmt. Y N
Confined Space Atmosphere
Gas Det S/N: ____ Cal Date: _____
Oxygen:_____> 19.5% and < 23.5%
Combustible:_____< 10% LEL Methane
Toxic: (1) _____ <10ppm H_2S
Source Isolation Required Y N

(1) ENMET CGS-90R: uses Broad Range Nonspecific sensor: 5 to 7 ppm H_2S = 35 ppm CO

Sewer Manhole Confined Space Entry Permit

Manhole No. (____)_____Date ____/____/

Manhole entry is not allowed unless all pre-entry conditions are acceptable as noted on this permit and the following equipment is in place:
- Operating gas dector in manhole
- Retrieval equipment in place
- Harness and life line attached
- Ventilation equipment operating for minimum of three minutes
- Personal protective equipment on:
  - Gloves
  - Hard Hat
  - Steel-toed Boots
- Rescue procedures for project identified above must be posted in vehicle and visible.
- Supervisor initials on permit certify all above conditions met

Authorized Entrant: _____
Entry Supervisor: _____
Supervisor as Attendant: Y N
If no, Authorized Attendant: _____
Entry Authorized ❑
Entry Supervisor Signature
✕_____
Time: __:__ ❑ AM ❑ PM
Permit duration 30 min. unless noted.
Comment on Hazards or Safety Procedure Deviations:

Pre-Entry Checklist
Surrounding Area Check P F
Engulfment Hazard Y N
Slip Hazard Y N
Communication Equipmt. Y N
Confined Space Atmosphere
Gas Det S/N: ____ Cal Date: _____
Oxygen:_____> 19.5% and < 23.5%
Combustible:_____< 10% LEL Methane
Toxic: (1) _____ <10ppm H_2S
Source Isolation Required Y N

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Comment on Hazards or Safety Procedure Deviations:

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Source Isolation Required Y N

(1) ENMET CGS-90R: uses Broad Range Nonspecific sensor: 5 to 7 ppm H_2S = 35 ppm CO

Form No.F0035B Revised Date Issue 12/5/94

EXHIBIT MI-2

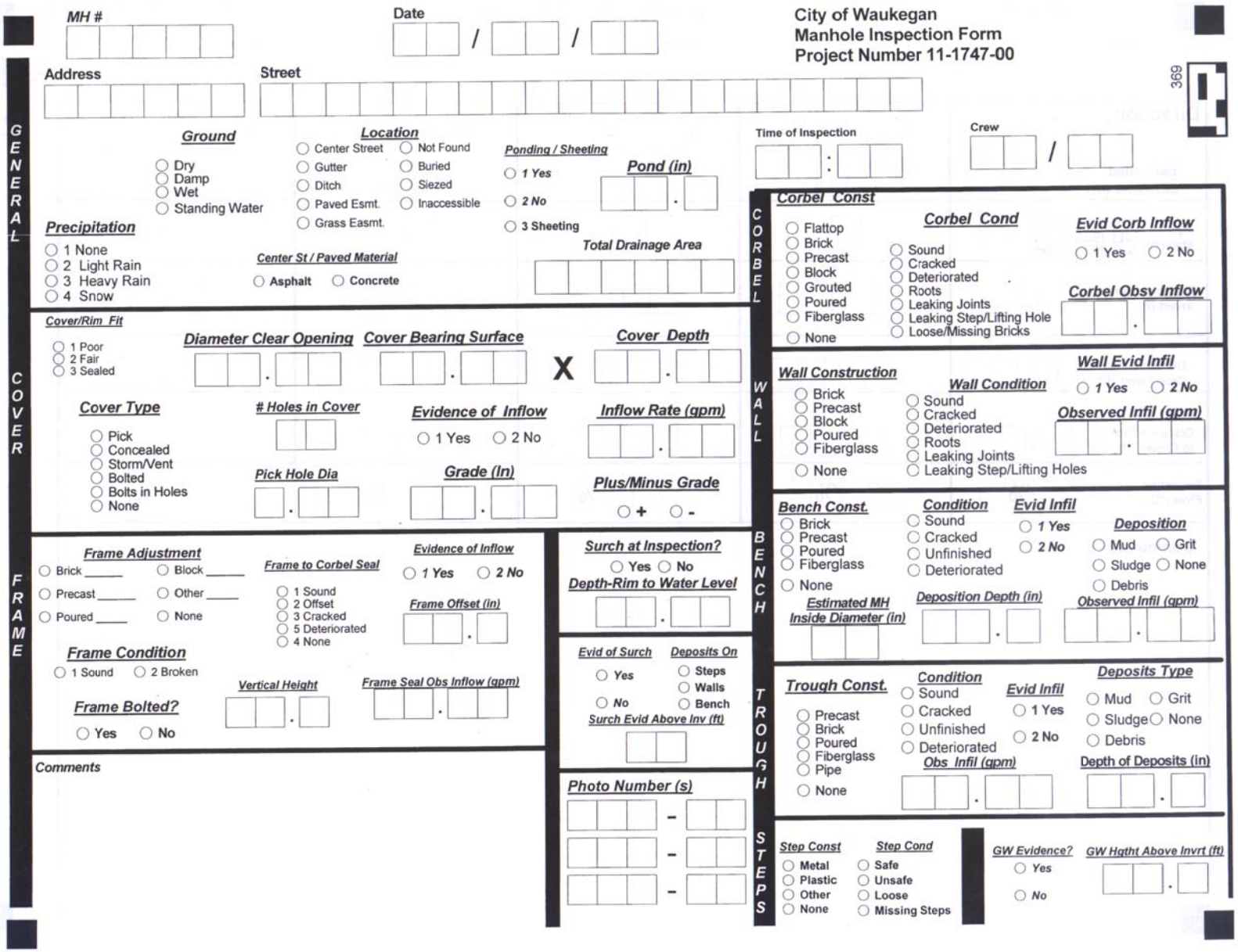
MH #
Date
/ /
City of Waukegan
Manhole Inspection Form
Project Number 11-1747-00
369
Address
Street
GENERAL
Ground
Dry
Damp
Wet
Standing Water
Location
Center Street
Gutter
Ditch
Paved Esmt.
Grass Easmt.
Not Found
Buried
Siezed
Inaccessible
Ponding / Sheeting
1 Yes
2 No
3 Sheeting
Pond (in)
Time of Inspection
Crew
Precipitation
1 None
2 Light Rain
3 Heavy Rain
4 Snow
Center St / Paved Material
Asphalt
Concrete
Total Drainage Area
COVER
Cover/Rim Fit
1 Poor
2 Fair
3 Sealed
Diameter Clear Opening
Cover Bearing Surface
X
Cover Depth
Cover Type
Pick
Concealed
Storm/Vent
Bolted
Bolts in Holes
None
Holes in Cover
Evidence of Inflow
1 Yes
2 No
Inflow Rate (gpm)
Pick Hole Dia
Grade (In)
Plus/Minus Grade
+
-
FRAME
Frame Adjustment
Brick
Block
Precast
Other
Poured
None
Frame to Corbel Seal
1 Sound
2 Offset
3 Cracked
5 Deteriorated
4 None
Evidence of Inflow
1 Yes
2 No
Frame Offset (in)
Frame Condition
1 Sound
2 Broken
Vertical Height
Frame Seal Obs Inflow (gpm)
Frame Bolted?
Yes
No
Surch at Inspection?
Yes
No
Depth-Rim to Water Level
Evid of Surch
Yes
No
Deposits On
Steps
Walls
Bench
Surch Evid Above Inv (ft)
Photo Number (s)
Comments
CORBEL
Corbel Const
Flattop
Brick
Precast
Block
Grouted
Poured
Fiberglass
None
Corbel Cond
Sound
Cracked
Deteriorated
Roots
Leaking Joints
Leaking Step/Lifting Hole
Loose/Missing Bricks
Evid Corb Inflow
1 Yes
2 No
Corbel Obsv Inflow
WALL
Wall Construction
Brick
Precast
Block
Poured
Fiberglass
None
Wall Condition
Sound
Cracked
Deteriorated
Roots
Leaking Joints
Leaking Step/Lifting Holes
Wall Evid Infil
1 Yes
2 No
Observed Infil (gpm)
BENCH
Bench Const.
Brick
Precast
Poured
Fiberglass
None
Condition
Sound
Cracked
Unfinished
Deteriorated
Evid Infil
1 Yes
2 No
Deposition
Mud
Grit
Sludge
None
Debris
Estimated MH Inside Diameter (in)
Deposition Depth (in)
Observed Infil (gpm)
TROUGH
Trough Const.
Precast
Brick
Poured
Fiberglass
Pipe
None
Condition
Sound
Cracked
Unfinished
Deteriorated
Evid Infil
1 Yes
2 No
Deposits Type
Mud
Grit
Sludge
None
Debris
Obs Infil (gpm)
Depth of Deposits (in)
STEPS
Step Const
Metal
Plastic
Other
None
Step Cond
Safe
Unsafe
Loose
Missing Steps
GW Evidence?
Yes
No
GW Hgtht Above Invrt (ft)

EXHIBIT MI-3

City of Waukegan

RJN Group, Inc. 11-1747-00

Visual Pipe Inspection Form

Date / /

MH #

Crew / /

226

Direction 1 -	2 -	3 -	4 -	5 -
Estimated Diameter (in)				
Pipe Material Con 1 VCP 2 PVC 3 CI 4 HDPE 5 CIPLINER 6 Other 7				
Distance Rim to Invert (ft)	.	.	.	.
Distance Rim to Drop Invert (ft)	.	.	.	.
Distance Rim to Crown (ft)	.	.	.	.
Estimated Flow (%)	%	%	%	%

Comments

EXHIBIT MI-4